

YEKA SUBCITY EDUCATION OFFICE (A.A)
GRADE 12 CHEMISTRY MODEL EXAMINATIONS
MIYAZIYA 2015/APRIL 2023

TIME ALLOWED 2:30 HRS

THIS BOOKLET CONTAINS **CHEMISTRY** EXAMINATION FOR **NATURAL SCIENCE** STREAM. IN THIS EXAMINATION, THERE ARE **80** MULTIPLE CHOICE QUESTIONS. FOLLOW THE INSTRUCTIONS CAREFULLY. SELECT THE CORRECT ANSWER AND BLACKEN ONLY THE LETTER OF YOUR CHOICE ON THE SEPARATE ANSWER SHEET PROVIDED.

YOU ARE ALLOWED TO WORK ON THE EXAM FOR **2:30 HOURS**. WHEN TIME IS CALLED, YOU MUST IMMEDIATELY STOP WORKING.

GENERAL DIRECTION

IN THIS EXAMINATION, THERE ARE A TOTAL OF **80** MULTIPLE CHOICE QUESTIONS. CAREFULLY SELECT THE CORRECT ANSWER AND BLACKEN ONLY THE LETTER OF YOUR CHOICE ON THE SEPARATE ANSWER SHEET PROVIDED. USE ONLY PENCIL TO MARK YOUR ANSWERS.

PHYSICAL CONSTANTS

Gas constant $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1} = 0.0821 \text{ L-atmmol}^{-1} \text{ K}^{-1}$

Avogadro's number $= 6.023 \times 10^{23} \text{ mol}^{-1}$

Plank's constant $h = 6.626 \times 10^{-34} \text{ J s}^{-1}$

Speed of light, $c = 3.0 \times 10^8 \text{ ms}^{-1}$

Rydberg constant $= -2.18 \times 10^{-18} \text{ J}$

Atomic Number (Z) and Atomic Weight (A)

Element	H	He	Li	Be	B	C	N	O	F
Z	1	2	3	4	5	6	7	8	9
A	1.0	4.0	6.9	9.01	10.8	12.0	14.0	16.0	19.0
Element	Ne	Na	Mg	Al	P	S	Cl	Ar	K
Z	10	11	12	13	15	16	17	18	19
A	20.2	23.0	24.3	26.98	31.0	32.1	35.5	39.95	39.0
Element	Ca	Mn	Cr	Cu	Zn	Br	Ag	I	Pb
Z	20	25	24	29	30	35	47	80	82
A	40.08	54.9	52	63.55	65.38	79.90	108	200.6	207

1. Detergents are preferable to hard soap for washing (cleaning process). This because detergents
 - A. Made with chemicals that are not affected by hard water.
 - B. Work equally well with hard and soft water
 - C. Are cheaper in price than hard soap
 - D. Are manufactured more easily than soaps
2. Which of the following is applicable for the solubility of gases in a liquid?
 - A. Increases with an increases in temperature and pressure
 - B. Decreases with an increases in temperature and pressure
 - C. Increases with decrease in temperature and increases as pressure increases
 - D. Increases with an increase in temperature and decreases as pressure increases
3. Three acids found in foods are lactic acid (in milk products), oxalic acid (in rhubarb), and malic acid (in apples). The pK_a values are LA = 3.88, OA = 1.23, and MA = 3.40. Which list has these acids in order of decreasing acid strength?
 - A. LA > OA > MA
 - B. LA > MA > OA
 - C. OA > LA > MA
 - D. OA > MA > LA
4. What would be the boiling point of 2.00 m solution of sucrose ($C_{12}H_{22}O_{11}$) in water at 1atm? (Kb for $H_2O=0.51^{\circ}C/m$, boiling point of $H_2O=100^{\circ}C$)
 - A. 101.02°C
 - B. 100°C
 - C. 99.5°C
 - D. 103.0°C
5. What is the $[H^+]$ of a 0.075 M solution of the acid HA if the Equilibrium Constant, K_a for HA is 4.8×10^{-8} ?
 - A. $6.1 \times 10^{-4} M$
 - B. $2.2 \times 10^{-4} M$
 - C. $6.0 \times 10^{-5} M$
 - D. $4.8 \times 10^{-8} M$
6. The thermodynamic quantity that expresses the degree of disorder in a system is
 - A. enthalpy
 - B. entropy
 - C. internal energy
 - D. bond energy
7. How many calories are required to raise the temperature of a 250 g sample of gold from $75^{\circ}C$ to $175^{\circ}C$? The specific heat of gold is $0.0308 \text{ cal/g } ^{\circ}C$.
 - A. 4.62 cal
 - B. 116 cal
 - C. 22,500 cal
 - D. 770 cal
8. Which statement about enthalpy is true?
 - A. Heat is given off to the surroundings in endothermic reactions.
 - B. Some substances have a negative specific heat capacity.
 - C. Specific heat capacity is the same for all liquids.
 - D. The sign of ΔH is always negative in exothermic reactions.

9. The simplest aromatic hydrocarbons is

- A. Alkane B. Benzene C. Alcohol D. Toluene

10. Which of the following is found in all alcoholic beverages and used as organic solvents?

- A. C_3H_7OH B. CH_3OH C. C_2H_5OH D. $C_5H_{11}OH$

11. The decomposition of large hydrocarbon molecules into smaller ones in the presence of catalyst is

- A. Catination D. Cracking C. Fermentation D. Polymerizing

12. Alcohols that yield Ketone on oxidation are classified as

- A. dihydric alcohols B. secondary alcohols
C. trihydric alcohols D. primary alcohols

13. Which one of the following substances helps to prevent infections in wounds by killing bacteria?

- A. Antiseptics B. Sedatives C. Disinfectants D. Analgesics

14. Alcoholic drinks like “tella” or “tej” when not properly kept turn sour. This is due to

- A. the oxidation of ethanol to ethanoic acid B. the oxidation of methanol to metanoic acid
C. the reduction of carbonic acid D. none of the above

15. A salt that absorb water from the atmosphere and form a solution is known as:

- A. Efflorescent salts C. Deliquescent salts
B. Hygroscopic salts D. Normal salts

16. Which of the following would react to form ethyl ethanoate?

- A. Ethanol and Ethanoic acid C. Ethanol and Butanoic acid
B. Methanol and Ethanoic acid D. Ethanol and Propanoic acid

17. Any discharge of a solid, liquid or gaseous substance or radiation (energy) into an environment that causes unwanted changes is said to be:

- A. Pollution B. Corrosion C. Contaminants D. Slug

18. A tooth paste has 0.2 g/L fluoride. Its concentration in ppb will be

- A. 2.5×10^4 B. 2.0×10^5 C. 4.0×10^5 D. 1.0×10^6

19. What is the mass of $\text{Al}_2(\text{SO}_4)_3$ in 350 mL of solution if the concentration is 0.148 N?

- A. 6.84 g B. 2.95 g C. 6.84 g D. 5.00 g

20. 35 grams of a chemical is dissolved in 65 grams of water. What is the % of solute in this solution?

- A. 31.8 % B. 35 % C. 75 % D. 50 %

21. Which one of the following correctly expresses spontaneous reaction?

- A. $\Delta G^\circ > 0$, $K < 1$, $E^\circ_{\text{Cell}} = 0$ C. $\Delta G^\circ < 0$, $K > 1$, $E^\circ_{\text{Cell}} > 0$
B. $\Delta G^\circ < 0$, $K > 1$, $E^\circ_{\text{Cell}} = 0$ D. $\Delta G^\circ < 0$, $K < 1$, $E^\circ_{\text{Cell}} < 0$

22. An aqueous solution is 0.907 M $\text{Pb}(\text{NO}_3)_2$. What is the molality of $\text{Pb}(\text{NO}_3)_2$ in this solution? The density of the solution is 1.252 g/mL

- A. 1.952 m B. 3 m C. 0.345 m D. 0.953 m

23. Which salt is commonly called 'Epsom salt'?

- A. $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ C. $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$
B. FeSO_4 D. BaSO_4

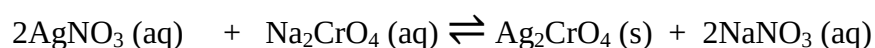
24. What is the solubility of oxygen gas in a sample of Langano lake water at 25°C under oxygen's partial pressure of $2.0 \times 10^{-2} \text{ atm}$? ($K_H = 1.23 \times 10^{-3} \text{ mol/L.atm}$)

- A. $2.46 \times 10^{-5} \text{ mol/L}$ B. 0.0213 mol/L C. 0.0615 mol/L D. 16.26 mol/L

25. Which industrial chemicals **mismatched** with its manufacturing process

- A. NH_3 - Haber process C. H_2SO_4 - contact process
B. HNO_3 - Solvay process D. S - Frash process

26. From the given molecular equation, what is the spectator ion?

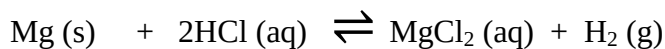


- A. Ag^+ B. CrO_4^{2-} C. Na^+ and NO_3^- D. Na^+ only

27. What volume of 0.4 M sucrose ($\text{C}_{11}\text{H}_{22}\text{O}_{11}$) contains 6.02×10^{22} molecules of sucrose?

- A. 25ml B. 50ml C. 250ml D. 400ml

28. What volume of 2 M HCl solutions is required to react with 6g of magnesium?

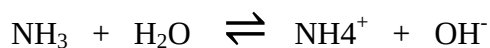


- A. 25ml B. 50ml C. 250ml D. 400ml

29. You have 200 ml of a 0.4 M NaCl solution and you want to dilute it to exactly 0.2 M.
How much water should you add?

- A. 100 ml B. 200 ml C. 300 ml D. 400 ml

30. From the given reaction, identify the two substances that act as Bronsted-Lowry bases



- A. NH_3 & OH^- B. H_2O & NH_4^+ C. NH_4^+ & OH^- D. OH^- & H_2O

31. One of the following is **not true** about the strength of conjugate acid – base pairs?

- A. The stronger the acid, the weaker is its conjugate base.
B. The stronger the base, the weaker is its conjugate acid.
C. The weaker the base, the weaker is its conjugate acid.
D. The weaker the base, the strong is its conjugate acid.

32. Dental amalgam contains mercury and silver. Which one of the correct class of solution does it belong?

- A. Liquid -Solid B. Liquid- Liquid C. Gas - liquid D. Solid – Solid

33. According to Bronsted - Lowry acid -base definition acid is define as a substance that:

- A. increase the concentration of hydrogen ion in the solution C. Proton acceptor
B. decreases the concentration of hydrogen ion in the solution. D. proton donor

34. The process of removing coloring matter from wood pulp and increasing its brightness.

- A. Annealing B. Bleaching C. Soaking D. Scudding

35. Consider the following equilibrium: $\text{HC}_2\text{O}_4^- + \text{HSO}_4^- \rightleftharpoons \text{H}_2\text{C}_2\text{O}_4 + \text{SO}_4^{2-}$

The order of Bronsted-Lowery acid- base in the reaction respectively are:

- A. base, acid, acid, base C. base, acid, base, acid
B. acid, base, acid, base D. acid, base, base, acid

36. Which of the following is the conjugate acid of the hydrogen phosphate ion, HPO_4^{2-} ?

- A. H_3PO_4 B. PO_4^{3-} C. H_2PO_4^- D. HPO_4^{2-}

37. The amount of anhydrous sodium carbonate (Na_2CO_3) molecular weight = 106 g/mol present in 250 ml of 0.25 M solution is

- A. 12.25 g B. 3.0 g C. 66.25 g D. 6.625 g

38. A solution was prepared by adding 48 g of methanol (CH_3OH) 81 g of water (H_2O). What is the mole fraction of methanol in this solution?

- A. 0.25 B. 0.75 C. 1.5 D. 4.5

39. What kind of solution forms when kerosene evaporates in air?

- A. Gas in gas solution C. Liquid in liquid solution
B. Gas in liquid solution D. Liquid in gas solution

40. What is the vapour pressure of a solution made by dissolving 218 g of glucose in 460 mL of water at 30 °C? (Assume that the density of water is 1.00 g/mL) and Vapour pressure of water at 30 °C is 31.82 kPa)

- A. 31.2 kPa B. 30.4 kPa C. 1.42 kPa D. 33.4 kPa

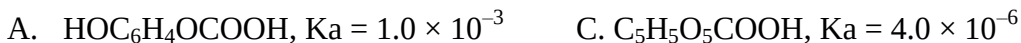
41. Which of the following describes an oxidation reaction?

- A. Losses of electrons or losses of oxygen
B. Losses of electrons or gains of oxygen
C. Losses of electrons or gains of hydrogen
D. Gains of electrons or gains of oxygen

42. When KCl dissolves in water

- A. The Cl^- ions are attracted to dissolve K^+ ions.
B. The Cl^- ions are attracted to the partially negative oxygen atoms of the water molecule.
C. The K^+ ions are attracted to Cl^- ions on the KCl crystal.
D. The K^+ ions are attracted to the partially negative oxygen atoms of the water molecule.

43. Which of the following acids should be used to prepare a buffer with a pH of 4.5?



44. As temperature increase rate of reaction increase due to:

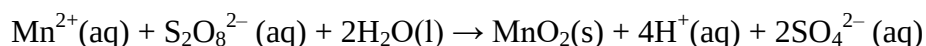
A. Numerical value of the rate constant of the reaction

B. Activation energy of the reaction.

C. Extent of molecular dissociation.

D. Frequency of collision of the reacting species.

45. Consider the following balanced redox reaction



Which of the following statements is true?

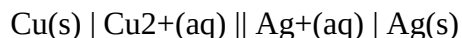
A. $\text{Mn}^{2+}(\text{aq})$ is the oxidizing agent and is reduced.

B. $\text{Mn}^{2+}(\text{aq})$ is the oxidizing agent and is oxidized.

C. $\text{Mn}^{2+}(\text{aq})$ is the reducing agent and is oxidized.

D. $\text{Mn}^{2+}(\text{aq})$ is the reducing agent and is reduced.

46. A voltaic cell is prepared using copper and silver. Its cell notation is shown below.



Which of the following processes occurs at the cathode?



47. One of the following is true about the correct expression for second-order reaction



48. During electroplating in an electrolytic cell

- A. The plating metal is used as anode C. The electrolyte is a salt of the metal to be plated
B. The metal to be plated is used as anode D. The plating metal is used as cathode

49. Electrolytic cells are

- A. Non-spontaneous changes, with a negative anode and a positive cathode
B. Non-spontaneous changes, with a positive anode and a negative cathode
C. Spontaneous changes, with a negative anode and a positive cathode
D. Spontaneous changes, with a positive anode and a negative cathode

50. How many grams of aluminum metal can be produced by the electrolysis of Al_2O_3 passing a current of 6 amperes for 48,250 second through the cell?

- A. 24gm B. 0.67 gm C. 27 gm D. 162gm

51. In an electrolysis experiment a current was passed through two cells connected in series. The first cell contains $\text{Al}(\text{NO}_3)_3$ solution and the second cell contains CuSO_4 solution. 9.54 grams of Al was deposited in the first cell. What mass of copper is deposited on cathode in the second cell?

- A. 24.2 g B. 34.2 g C. 14.2 g D. 44.2g

52. Which of the following branch of chemistry is the study of all elements and their compounds with the exception of carbon and its compound?

- A. Physical chemistry B. Analytical chemistry C. Inorganic chemistry D. organic chemistry

53. How many significant figures are there in 0.000450602?

- A. 9 B. 8 C. 7 D. 6

54. All cathode rays are the same regardless of the nature of electrode material, residual gas and conductive wire used in cathode ray tube. The observation shows that:

- A. Cathode rays do not deflected by magnet. C. Cathode rays have particle nature
B. Electrons are fundamental particles. D. Cathode rays are attracted by negative plate

55. There are two isotopes of lithium found on earth. Isotope ${}^6\text{Li}$ ($6.01512m_u$) accounts for 7.42% of the total and isotope ${}^7\text{Li}$ ($7.01600m_u$) accounts for the remaining 92.58%. What is the average atomic mass of lithium?

- A. $7.942m_u$ B. $6.942m_u$ C. $6.015 m_u$ D. $8.942m_u$

56. What is the energy, in joules, of a photon of red light that has the frequency of $3.73 \times 10^{14} \text{ s}^{-1}$?
A. 2.47×10^{-19} B. 2.47×10^{-20} C. 8.04×10^{-7} D. 1.119×10^{24}

57. Which region of the electromagnetic spectrum is capable of inducing electron transition with the greatest energy?

- A. Microwave B. visible C. X-ray D. Infrared

58. Which of the following is **NOT TRUE** about rays emitted from radioactive element?

- A. α - particles is neutral charged particle
B. β^- particle is negative charged particle
C. γ -radiation is positive charged particle
D. All are not true except B.

59. The maximum number of electrons in an orbital of an atom possessing a quantum number $n=3$, $l=2$ and $m_l=1$

- A. 6 B. 18 C. 8 D. 2

60. When the atoms Cl, S, P, Si are arranged in order of increasing atomic size, which is correct order? (Atomic Number Si=14, P=15, S=16, Cl=17)

- A. Si, P, S, Cl B. Cl, S, P, Si C. P, Si, Cl, S D. Cl, Si, S, P

61. Which of the following **NOT TRUE** about factors affecting formation of ionic bonding?

- A. Elements having low ionization energy have a more favorable chance to form cation.
B. Higher electron affinity favors the formation of anion.
C. Elements having either most electronegativity or less electronegativity favor the formation of ionic compound.
D. If the total energy released is more than that which is absorbed, then the formation of ionic compound is favored.

62. The prefix Tera stands for the exponential _____

- A. 10^{-12} B. 10^{12} C. 10^9 D. 10^6

63. Which of the following contradict the Bohr model of the atom?

- A. Aufbau principle C. Heisenberg uncertainty principle
B. Pauli's exclusion principle D. Hund's rule

64. Which of the following molecule would you expect to be non-polar?

- A. NH_3 B. BCl_3 C. H_2O D. HCHO

65. Which of the following molecule has V- shape?
 A. CO_2 B. H_2O C. NH_3 D. CH_4
66. All of the following are crystalline solid except?
 A. Sodium chloride B. Gold C. Dry ice D. Rubber
67. Metallic bond is formed by electrostatic attraction between
 A. Delocalized electrons and cations C. Delocalized electrons and positive nuclei
 B. Delocalized electrons and anion D. Cations and anions
68. What is the hybridization of boron in BCl_3 ? (At.no B=5, Cl=17)
 A. sp B. sp^3 C. sp^2 D. sp^3d
69. How many lone pairs of electrons are there on the oxygen atom in O_3 ?
 A. Six B. Five C. Four D. Three
70. Which of the following molecule contain a two pi bond and one sigma bond?
 A. CO B. CH_4 C. HCN D. H_2O
71. What is the bond order for CN^- ? (At.no C=6, N=7)
 A. 2.5 B. 3 C. 1.5 D. 2
72. Which of the following temperature scale is greatest?
 A. 15°C B. 288K C. 59°F D. All are equivalent
73. Which one the following is molecule do **NOT** obey octet rule except? (At.no H =1, B =5, N =7, O =8, F =9)
 A. NO B. NO_2 C. BF_3 D. H_2O
74. Which group of elements is more reactive of all the metallic elements?
 A. Transition metals B. Alkaline earth metals C. group B metals D. Alkali metals
75. Which is the correct representation that contains 16 protons, 18 electrons and 16 neutrons?
 A. $^{32}_{16}\text{S}$ B. $^{32}_{18}\text{S}^{2-}$ C. $^{32}_{16}\text{S}^{2-}$ D. $^{32}_{18}\text{S}$
76. Which one of the following is true about the chemistry laboratory safety rules?
 A. Wear appropriative protective clothing. C. Do not smell any chemicals directly.
 B. Wear shoes that cove your feet. D. All of the above.
77. One of the following is uncertainty in measurement can be caused by:
 A. Observational error C. Instrumental error
 B. Variability in the item measured D. All of the above
78. The reaction between alcohol and carboxylic acid is

A. Esterification B. Saponification C. Hydrolysis D. Dehydration

79. The conversion of primary alcohol into carboxylic acid is

A. Addition B. Reduction C. Oxidation D. Elimination

80. At STP, 0.280 L of a gas weighs 0.400 g. what is the molar mass of the gas

A. 31.98 g/mol B. 16.5 g/mol C. 40.6 g/mol D. 73. 2 g/mol

